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PLANT COMMUNITIES OF CULTIVATED FIELDS OF THE PODLASKI PRZEŁOM BUGU MESOREGION

PART 5. ROOT CROP COMMUNITIES OF LIGHT SOILS

Zofia Rzymowska, Janina Skrzyczyńska

The Agricultural Ecology Department of the University of Podlasie in Siedlce
B. Prusa 14, 08 110 Siedlce, Poland, ekorol@ap.siedlce.pl

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S u m m a r y

This present paper, focused on root crop communities of light soils, is a part of the wide range characteristics of segetal communities of the Podlaski Przełom Bugu (Podlasie Bug River Gorge) mesoregion. On the basis of 160 phytosociological relevés made according to the Braun Blanquet method, phytocenoses re presenting the *Panico-Setarion* alliance were distinguished. Most often, patches of the association *Echinochloo-Setarietum* were re corded in the study area. Heterogeneous habitat conditions affect its floristic diversity. Two subassociations of the phytocenosis, di vided according to the species composition into 9 lower syntaxa, were identified on light soils. The following subassociations were distinguished: *Echinochloo-Setarietum setarietosum glaucae* in a typical variant and a variant with *Juncus bufonius,* both with subvariants with *Digitaria ischaemum*, as well as a typical variant of *Echinochloo-Setarietum typicum*, a variant with *Juncus bufonius* and a subvariant with *Oxalis stricta* in the typical and wet va riant. Another association found in root crops on light soils of the Podlaski Przełom Bugu mesoregion is *Digitarietum ischaemi*. Its patches were observed in cultivations on light, acidic, poor soils. The characteristic feature of this community is the occurrence of numerous acidophilous species. In habitat conditions typical for the Podlaski Przełom Bugu mesoregion, *Digitarietum ischaemi* is differentiated into the typical and wet variant. Quite frequent pat ches of the *Setaria pumila-Setaria viridis* community were noted in intermediate habitat conditions, between those characteristic for *Digitarietum ischaemi* and *Echinochloo-Setarietum.*

Key words: cultivated fields, root crop communities, light soils, Podlaski Przełom Bugu mesoregion

INTRODUCTION

The floristic composition of agrophytocenoses is determined by agricultural practice and natural conditions. Root crop communities are formed under the influence of high fertilisation, also including organic fertilisation, and crop protection agents used. Their characteristic feature is a large share of nitrophilous and thermophilic species.

In connection with changes in the crop structure and a growing share of cereal crops, as well as the increasing area of fallow land in the study area, root crop communities are less and less frequently found and they occupy small areas.

The purpose of the study was to demonstrate the floristic and phytosociological diversity of communities which develop in agrophytocenoses of the Podlaski Przełom Bugu mesoregion.

This paper is a continuation of the characteristics of plant communities of agrocenoses of the Podlaski Przełom Bugu mesoregion (S k r z y c z y ń s k a and R z y m o w s k a, 2005; R z y m o w s k a and S k r z y c z y ń s k a, 2006a, 2006b, 2006c). The study area and methodological assumptions, including abbreviations and numbers of localities used in the tables, are presented in the paper S k r z y c z y ń s k a and R z y m o w s k a (2005). Due to extensive documentation material taking into account the diversity of habitats of the Podlaski Przełom Bugu mesoregion, it was divided into two parts, notably, communities developing primarily on light soils and on cohesive soils. This is a conventional division; this paper presents root crop phytocenoses developing most frequently on light sandy, poorly fertile and usually acid soils. The documentation material comprised 160 phytosociological relevés.

RESULTS

Systematics of distinguished root crop communities

Class: *Stellarietea mediae* (R. Tx., Lohm. et Prsg, 1950)

Order: *Polygono-Chenopodietalia* (R. Tx. et Lohm. 1950) J. Tx. 1961
Alliance: *Panico-Setarion* Siss. 1946
Association: *Digitarietum ischaemi* R. Tx. et Prsg (1942) 1950
Subassociation: *Digitarietum ischaemi typicum*
a.typical variant
b. variant with *Gnaphalium uliginosum*
Community *Setaria pumila-Setaria viridis*
a.typical form
b. form with a share of hygrophilous species
Association: *Echinochloo-Setarietum* Krusem. et Vlieg. (1939) 1940
Subassociation: *Echinochloo-Setarietum setarietosum glaucae*
a.typical variant
– subvariant with *Digitaria ischaemum*
b. variant with *Juncus bufonius*
– subvariant with *Digitaria ischaemum*
Subassociation: *Echinochloo-Setarietum typicum*
a.typical variant
– subvariant with *Oxalis stricta*
b. variant with *Juncus bufonius*
c.variant with *Gnaphalium uliginosum*
– subvariant with *Oxalis stricta*

Characteristics of distinguished associations and communities

In root crops of the Podlaski Przełomu Bugu mesoregion, on light, sandy and acid soils, the occurrence of patches of two associations and a community from the *Panico-Setarion* alliance was found. These are *Digitarietum ischaemi* and *Echinochloo-Setarietum* and the *Setaria pumila-Setaria viridis* community.

***Digitarietum ischaemi* R. Tx. et Prsg (1942) 1950**

Typical patches of this association developed on sandy, acid and poorly fertile soils. Such phytocenoses developed both on dry and excessively wetted soils, what formed the basis for distinguishing the typical variant and the variant with *Gnaphalium uliginosum*.

The typical variant of the association was found on alluvial soils and on brown leached soils classified as the very weak and weak rye complex. It was described based on 25 phytosociological relevés (Tab. 1). In these patches, the characteristic species of the association – *Digitaria ischaemum* – dominated. *Setaria pumila* also had a large share in them. *Setaria viridis* occurred often, but with much lower cover. Frequent components of these phytocenoses were also other acidophilous species: *Rumex acetosella, Equisetum arvense*, *Raphanus raphanistrum*, *Spergula arvensis* and *Fallopia convolvulus*. Their quantitative share was however much smaller compared to the abovementioned weeds.

The wet variant of *Digitarietum ischaemi* developed most frequently on soils of the weak and good rye complex, as well as the weak cereal and grazing complex. It is demonstrated by 10 phytosociological relevés (Tab. 1). These patches were characterised by larger cover with *Digitaria ischaemum* and *Setaria viridis*, as well as the presence of hygrophilous species. *Gnaphalium uliginosum* and *Juncus bufonius* dominated among them. *Agropyron repens* also occurred there more frequently than in the typical phytocenoses and with much larger cover.

The *Digitarietum ischaemi* association was composed of 58 species (40 in the typical variant and 45 in the variant with *Gnaphalium uliginosum*). In one relevé, 10 – 16 species (on the average 12) occurred in the typical patches and 11 – 27 (on the average 18) in the patches of the variant with *Gnaphalium uliginosum*.

***Setaria pumila-Setaria viridis* community**

The occurrence of patches of the *Setaria pumila-Setaria viridis* community, characterised by a large share of distinguishing species, was noted in root crops of the study area. It is documented by 20 phytosociological relevés (Tab. 2). The variation of soil moisture conditions of the habitats on which such phytocenoses were noted divides them into the typical form and the form with a share of hygrophilous species. Patches typical for this community developed on sandy soils classified most frequently as the weak rye complex. Apart from the distinguishing species with high permanence and large cover, the following were noted in them: *Chenopodium album*, *Raphanus raphanistrum*, *Equisetum arvense* and *Fallopia convolvulus*.

The form with a share of hygrophilous species was distinguished by the occurrence of a numerous group of species, indicating excessive wetting of the habitats. *Gnaphalium uliginosum* was encountered most frequently among them. On the other hand, *Stachys palustris*, *Polygonum amphibium* and*Juncus bufonius* occurred less frequently, but with large cover. These phytocenoses were more weed infested than the typical patches. *Agropyron repens*, *Artemisia vulgaris*, *Chenopodium album*, *Viola arvensis*, *Matricaria maritima* ssp. *inodora*, *Sonchus arvensis*, *Stellaria media* and *Cirsium arvense*, among others, reached in them larger cover and often higher permanence. But the share of acidophilous species, such as *Raphanus raphanistrum*, *Spergula arvensis*, *Anthemis arvensis*, *Rumex acetosella* and other, decreased.

The community was made up of 78 species (47 composed the typical form and 70 composed the form with a share of hygrophilous species). The number of species in one relevé ranged, respectively, from 11 to 23 (on the average 16) and from 16 to 29 (on the average 23).

Table 1
Digitarietum ischaemi Tx. et Prsg. (1942) 1950.

Subassociation	typicum																														
Variant	typowy																	*z Gnaphalium uliginosum*													
No of picture in table	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Mean number of species within the picture		16	17	18	19	20	21	22	23	24	25	Mean number of species within the picture			
No of picture in nature	2045	2043	1958	1936	2182	2113	435	316	298	277	998	1134	1925	1841	1844			2176	2175	1967	2012	2013	367	266	1059	1876	1874				
Date; month	8	8	8	8	9	9	8	8	8	8	8	8	8	8	8			9	9	8	8	8	8	8	8	8	8				
Date year	97	97	97	97	94	97	95	95	95	95	96	96	97	97	97			94	94	97	97	97	95	95	96	97	97				
Locality	15	98	24	93	27	42	54	6	60	17	25	71	72	87	56			75	75	73	98	98	106	17	3	56	56				
Soil unite	7F ps.pl	7F ps.pl	7Bw ps.pl	6F ps:pl	6Bw ps:pl	7Bw ps.pl	6Bw ps:pl	6Bw psp:pl	6Bw ps:pl	6F ps:pl	7Bw pl	7Bw ps.pl	7Bw ps.pl	7Bw ps:pl	7Bw ps			6Bw ps:pl	6Bw ps	4A pgm.gl	9Dz pgl.pl	6Dz ps:pl	4F pgl.p.lz	6Bw ps:pl	6F psp	5Bw pgl.ps:gl	9Dz pgl.ps				
Range of cultivated plant over field in%	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n			z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n				
Range of weeds over field in %	40	25	35	40	80	35	20	50	45	20	25	10	25	35	30			70	70	55	90	60	60	15	30	70	70				
Numbers of weeds over field in %	13	11	10	10	11	12	14	15	16	11	10	11	11	12	12	12		12	11	16	17	16	23	20	17	25	27	18			
Cultivated plant																															
Solanum tuberosum	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n			z.n	4.4	5.5	z.n	z.n	z.n	z.n	z.n	z.n	z.n				
I. Ch. D. *Digitarietum ischaemi*																**S**	**W**											**S**	**W**		
Digitaria ischemum	2	2	2	3	1	1	1	2	1	2	2	1	2	2	2	V	1467	4	2	2	3	1	1	+	1	+	2	V	1695		
Setaria pumila					3	2		1	2	+	1	+		1	1	III	630	1	3	1		1	1	+		1	1	IV	685		
Setaria viridis	1	1	1		+	1	1		+		1	1	1		1	IV	313		+			2	1	1		1	2	III	510		
II. D. var. z *Gnaphalium uliginosum*																															
Gnaphalium uliginosum																		1	1	+	3	1	1	+	+	1	1	V	705		
Juncus bufonius																		+	1		2	+		+	+		1	IV	315		
Gypsophila muralis																		+	+				+	+	+	+	+	IV	70		
Spergularia rubra																				1	1	+				+		II	120		
Stachys palustris																					+		+				+	II	30		
III. Ch. D. *Panico-Setarion*																															
Polygono-Chenopodietalia																															
Spergula arvensis		1	1	+				1	+		+	+	+	1	+	IV	173	+	+	+		1	1	+			+	IV	150		
Chenopodium album	1	+	+	+		+	+	1	+	+	+	+		+		IV	133	+		1	+	+		+	+	+	+	IV	120		
Raphanus raphanistrum	+	+			+	1	1	1	1	+			+	1	+	IV	207	+			+	1	1	+	1			III	180		
Scleranthus annuus	1			+				+	+				1	1		II	120	+	+	+	+		+	+	+		+	IV	80		
IV. Ch. *Stellarietea mediae*																															
Rumex acetosella	1	+	1	+		1		+		+	+			1	1	IV	200	+	+	+	+	1	2		+		1	IV	325		
Fallopia convolvulus		+	+	+		+	+	1		+			+	+	+	IV	93			+	+			1	+	2	+	III	265		
Anthemis arvensis			+	+				+		+	+		+	+	+	III	53			+	+		1			+	1	III	130		
Centaurea cyanus		+					+		+		+					II	27			+		+			+	+	+	III	50		
Viola arvensis				+	+	+										I	20	+				+	+			+	+	III	50		
Polygonum aviculare								+	+							I	13			+	+			+		+	+	III	50		
Myosotis arvensis									+							I	7						+	+		+	+	II	40		
Stellaria media																							+			1	+	II	70		
V. Accompanying species																															
Equisetum arvense		+	1		+	+	1	1	2	+		+	+	1	+	IV	297	+	+			+	+	1	1			III	140		
Agropyron repens		+					+			+		+	+	+		II	40			2	+	+	+	+	1	1	1	IV	365		
Convolvulus arvensis			+	+	+		+		+			+	+			III	47		+				+	+		+	+	III	50		
Polygonum lapathifolium ssp. lapathifolium	+	+	+							+		+			+	II	40			+		+	+		+	+	+	III	60		
Polygonum persicaria								+								I	7			+			+	+	+		+	III	50		
Erodium cicutarium				+	+		+	+	+		+					II	40							+		+		I	20		
Cirsium arvense									+							I	7				+		+	+	+			II	40		
Erigeron acris	+					+		+	+							II	27														

(Sporadic species): II *Mentha arvensis* 19(+); **III** *Polygonum lapathifolium* ssp. *pallidum* 7(+), 21(+); *Sonchus arvensis* 24(3), 25(1); *Echinochloa crus-galli* 11(r); *Capsella bursa-pastoris* 25(+); **IV** *Vicia villosa* 8(+), 24(+); *Galeopsis tetrahit* 12(+), 21(+); *Vicia tetrasperma* 24(+), 25(+); *Crepis tectorum* 1(+); *Conyza canadensis* 5(3); *Arabidopsis thaliana* 19(+); *Vicia hirsuta* 24(+); **V** *Galeopsis ladanum* 14(+), 15(+), 18(+), 25(+); *Agrostis stolonifera* 1(1), 20(1), 23(1); *Artemisia vulgaris* 5(+), 6(+), 7(+); *Achillea millefolium* 10(+), 13(+), 15(+); *Leontodon autumnalis* 1(+), 7(+); *Ornithopus sativus* 12(+), 21(+); *Veronica arvensis* 24(+), 25(+); *Galeopsis bifida* 1(+); *Hypochoeris glabra* 1(+); *Malva pusilla* 5(+); *Melandrium album* 6(+); *Oenothera biennis* 7(+); *Plantago lanceolata* 9(r); *Verbascum nigrum* 19(r); *Cardaminopsis arenosa* 22(+); *Saponaria officinalis* 23(r); *Trifolium repens* 24(+); *Arenaria serpyllifolia* 24(+).

(Comments): (numbers after of species inform about numbers of picture in the table), z.n (withered top leaves)

Table 2

Community Setaria pumila-Setaria viridis.

Form	typowa												z udziałem gatunków higrofilnych											
No of picture in table	1	2	3	4	5	6	7	8	9	10	Mean number of species within the picture		11	12	13	14	15	16	17	18	19	20	Menumber of species within the picture	
No of picture in nature	2203	452	361	276	1022	958	1885	1915	1926	1990			271	279	275	461	479	1053	1173	2198	2172	1875		
Data: miesiąc month	9	8	8	8	8	8	8	8	8	8			8	8	8	8	9	8	8	9	9	8		
Date rok year	94	95	95	95	96	96	97	97	97	97			95	95	95	95	95	96	96	94	94	97		
Locality	7	53	106	17	26	39	56	57	49	13			17	17	17	62	12	52	67	76	75	56		
Soil unite	6Bw pgm:p:pl	6Bw ps:pl	6Bw ps.pl	5F pgl:pl	6Bw ps:pl	6Bw pgl.pl	6Bw ps:pl	6Bw ps:pl	6F psp:pl	4A pgl.gl			6F ps:pl	6F ps:pl	5F pgl:pl	4Bw pgl.gs	8Dz pgm:gl	9F pgl:p	4A pgm.g:sp	5Bw pgl:gl	9D pgl	9Dz pgl:ps		
Range of cultivated plant over field in %	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n			z.n	70	75	z.n	z.n	z.n	z.n	z.n	z.n	z.n		
Range of weeds over field in %	25	50	50	40	25	15	30	25	20	25			85	40	40	50	80	60	50	60	75	80		
Numbers of weeds over field in %	16	17	20	13	23	16	13	11	17	12	16		17	25	19	29	28	29	21	16	19	27	23	
Cultivated plant																								
Solanum tuberosum	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n			z.n	4.4	5.5	z.n	z.n	z.n	z.n	z.n	z.n	z.n		
I. D. *Setaria glauca-Setaria viridis*											**S**	**W**											**S**	**W**
Setaria pumila	1	1	1	1	1	1	1	2	1	1	V	625	1	2	+	+	1	+	+	3	+	+	V	710
Setaria viridis	1	2	1	+	+	+	2	+	+	+	V	510	1	+	+	+	+	+	1	+	+	+	V	180
II. D. form with hygrophilous species																								
Gnaphalium uliginosum														+		1	+	1	+	1	1	+	IV	240
Stachys palustris														+	+	+	1					3	III	455
Polygonum amphibium													3	1	2								II	600
Juncus bufonius																		+		+	3		II	395
Gypsophila muralis																+			+	1		1	II	120
Mentha arvensis															+		1		1				II	110
Plantago intermedia																	+	+		+			II	30
III. Ch. *D. Panico-Setarion,*																								
Polygono-Chenopodietalia																								
Chenopodium album	1	+	2	1	1	1	+	+	+	1	V	465	+	1	+	1	1	3	2	1	+	+	V	790
Raphanus raphanistrum		2	+	1	1	1			+	1	IV	395	1	+	1	+					+		III	130
Spergula arvensis		1	+		+	+			+	+	III	100	+			+				+		+	II	40
Scleranthus annuus		+			+	+			+	+	III	50				+		1				+	II	70
Stellaria media	+		+		+	+					II	40		+	+	+	1	+				1	III	140
Sonchus arvensis	+										I	10		+	+		1			+		2	III	255
Capsella bursa-pastoris			+				+		+		II	30				+	+	+	+				II	40
Matricaria maritima ssp. *inodora*										+	I	10				+		1		+	2		II	245
IV. Ch. *Stellarietea mediae*																								
Fallopia convolvulus	+	+	1	1	+	+	+	+	+		V	170	1	1	1	1	+	+	+		+	1	V	290
Viola arvensis		+	+	+	+	+			+		III	60	+	+		1		+	+		+	+	IV	110
Centaurea cyanus	+	+		+	+			+			III	50	+			+		+	+		+	+	III	60
Anthemis arvensis	1		+		1			+	1	+	III	180		+		1				+		+	II	80
Myosotis arvensis				+	+		+				II	30	+	+			+	+	+			+	III	60
Polygonum aviculare			+								I	10		+		+				+	+	+	III	50
Vicia tetrasperma					+						I	10					+	+				+	II	30
Sinapis arvensis														+			1	+					II	70
V. Accompanying species																								
Equisetum arvense		1	1	2	+	+	+		1	+	IV	365	1	1	+	2				1			III	335
Agropyron repens		+	1	+		+					II	80	2		+	+	3	1			+	+	IV	640
Artemisia vulgaris	+								+	+	II	30	1	+	1				1	+	2	+	IV	355
Erodium cicutarium	+	+	+	+	+		+	+	+		IV	80	+			+							I	20
Convolvulus arvensis	+	+	1		+	+					III	90				+	+			+	+	1	III	90
Cirsium arvense			+	+	+						II	30	+		1		+			+	+	1	III	140
Rumex acetosella		+	+			+			+	1	III	90				1		+					I	60
Polygonum persicaria					+						I	10		+	+	+	+		+			+	III	60
Polygonum lapathifolium ssp. *lapathifolium*	+			+	+	+					II	40		+				+	1				II	70
Arenaria serpyllifolia	+						1	+			II	70		+									I	10
Achillea millefolium		+				+					I	20										+	I	10
Plantago major					+						I	10					+	+			+	+	II	40
Cardaminopsis arenosa																+	1	+					II	70
Veronica arvensis																	+	+	+			+	II	40
Erigeron acris														+		+						+	II	30
Taraxacum officinale															+			+			+		II	30

(Sporadic species): **II** – *Spergularia rubra* 10(+), 16(+); *Potentilla anserina* 13 (+), 17 (+); *Rorippa sylvestris* 15(1), 16(1); *Sagina procumbens* 15(+); *Anthoceros punctatus* 15(+); **III** – *Anchusa arvensis* 1(+), 5(+), 7(+), 11(+); *Polygonum lapathifolium* ssp. *pallidum* 2(+), 3(+), 13(+); *Galinsoga parviflora* 7(+), 8(+); *Digitaria ischaemum* 14(+); *Fumaria officinalis* 6(+); *Lapsana communis* 8(+); *Euphorbia helioscopia* 13(+); *Lamium purpureum* 14(+); **IV** – *Galeopsis tetrahit* 3(+), 5(+); *Vicia villosa* 20(+); *Vicia angustifolia* 9(+), 14(+); *Vicia hirsuta* 9(+), 15(+); *Anagallis arvensis* 16(+), 17(+); *Apera spica-venti* 12(+); *Conyza canadensis* 19(+); **V** – *Galium aparine* 7(+), 15(+), 17(+); *Melandrium album* 8(+), 11(+), 12(+); *Avena strigosa* 3(+), 12(+); *Erysimum cheiranthoides* 7(+), 17(1); *Berteroa incana* 9(+), 12(+); *Plantago lanceolata* 15(r), 16(r); *Cichorium intybus* 1(r); *Knautia arvensis* 1(r); *Valeriana officinalis* 2(r); *Galeopsis bifida* 5(+); *Centaurea stoebe* 14(r); *Symphytum officinale* 15(+); *Cerastium holosteoides* 16(+); *Rumex obtusifolius* 16(+); *Poa annua* 17(+); *Leontodon autumnalis* 17(+); *Trifolium arvense* 19(+).

(Comments): (numbers after of species inform about numbers of picture in the table), (withered top leaves).

Table 3

Echinochloo-Setarietum Krus. et. Vlieg. 1939.

Subassociation	***setarietosum glaucae***																																			
Variant	***typowy***																						***z Juncus bufonius***													
No of picture in table	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Mean numer of species within the picture		21	22	23	24	25	26	27	28	29	30	Mean numer of species within the picture	
No of picture in nature	2169	1819	1816	2048	2029	481	272	352	323	321	291	304	449	429	936	912	902	1880	1822	1921			1176	1130	2197	2091	2004	2021	2245	930	1929	1960		
Data: miesiąc month	9	7	7	8	9	9	8	8	8	8	8	8	8	8	8	8	8	8	8	8			8	8	9	9	8	8	9	8	9	8		
Date rok year	94	97	97	97	97	95	95	95	95	95	95	95	95	95	96	96	96	97	97	97			96	96	94	97	97	97	97	96	97	97		
Locality	75	21	46	15	78	12	17	32	6	6	60	58	53	54	100	101	84	56	66	72			67	68	76	44	99	78	92	39	49	73		
Soil unite	4A plz:gs	6Bw ps:.gl	6Bw psp:.gsp	6F psp.pl	5Dz pgl:pl	5Bw pgl:pl	5F pgl:pl	5F ps:plz	6Bw psp:pl	5Bw pglp.pl	5Bw pgl:gl	5A plz:pgl	6Bw ps:pl	4Dz pgm.gl	6Bw ps:pl	4Bw pgm.gs	4A pgm.gl	6Bwps:pl	5D pgl:ps	5F pgl:pl			4A pgm.gl	8F plz.pl	5Bw pgl:gl	6Bw pgl.gl	4A pgm.gs	8Dz pgl.glp	9F psp:pl	4A pgl	5F pglp. psp:pl	9A pgl.gl		
Range of cultivated plant over field in %	z.n	85	70	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	80	75	z.n			z.n	z.n	z.n	z.n	z.n	z.n	z.n	80	z.n	z.n		
Range of weeds over field in %	70	15	40	45	70	80	30	65	50	55	75	90	30	60	70	20	50	20	60	30			45	50	45	85	35	30	95	20	25	35		
Numbers of weeds over field in %	14	13	12	10	21	17	17	18	15	22	20	18	17	20	14	12	23	13	21	21	17		26	28	19	23	23	21	19	23	20	17	22	
Cultivated plant																																		
Solanum tuberosum	z.n	5.5	4.4	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	5.5	5.5	z.n			z.n	z.n	z.n	z.n	z.n	z.n	z.n		z.n	z.n		
Beta vulgaris (pastewne)																														5.5				
I. Ch. Echinochloo Setarietum																					**S**	**W**											S	W
Echinochloa crus-galli	2	1	1	2	1	2	1	+	3	2	1	2	1	1	3	1	1	1	2	1	V	1180	1	1	1	1	1	1	1	1	1	1	V	500
Raphanus raphanistrum	1	+	1	1	+	+	+	+	+	+	2	1	+	1	1	+	+	+	+	1	V	323				1	+						I	60
II. D. E-S setarietosum glaucae																																		
Setaria pumila	2	1	2	1	2	1	1	3	1	1	1	1	1	1	1	1	1	1	2	1	V	913	1	+	2	3	2	1	1	1	1	1	V	1035
Setaria viridis		1	+	1	1	1	+	+	+	+	1	1		+	+	+	+	+	+	+	V	210	+			1	+		+	1			III	130
Spergula arvensis		+	+	+	+		+		+	+	1		+	+	1	+	+	+	+	+	IV	120	+	+	+			1		+	+		III	100
Scleranthus annuus		+			+				+	+				+	+				+	+	II	40		1		1	+	+		+	+	+	IV	150
Rumex acetosella		+			1				+	1	1		+			+		+		+	III	105	+			1	+	1		+			III	130
III. D.var.z Juncus bufonius																																		
Juncus bufonius																+					I	5	+	2	+	+	+	1	2	+	+	1	V	510
Gnaphalium uliginosum																	+				I	5	1	+	1	1	1	1	+	+	+	1	V	340
Gypsophila muralis	+																				I	5		+	+	+		+	+				III	50
Plantago intermedia	+																				I	5	+		+				1	+	+	+	III	100
Stachys palustris																			+		I	5				+							I	10
Mentha arvensis																											+	1	1	+			II	120
Anthoceros punctatus																												+	1		+		II	70
Spergularia rubra																								+	+	+						+	II	40
Riccia sp.																												+	+		+		II	30

cd. Table 3

IV. Ch. D. Panico-Setarion,																															
Polygono-Chenopodietalia																															
Chenopodium album	2	+	+		+	+	+	1	+	1	2	1	1	2	1	1	2	+	+	1	V	565	1	1	1	+	+	+		+	1	+	V	250
Stellaria media	+				+			+		+		+		+			1			+	II	60	1	+	+	1	+		+			+	IV	150
Capsella bursa-pastoris						+				+							+	+	+		II	25	+			+				+			II	30
Galinsoga parviflora								+		+	+	3		+			1		+	+	II	243				+	+		+				I	30
Polygonum lapathifolium ssp. pallidum							+		+	+		+	+	+		+					II	35											
Matricaria maritima ssp. inodora	+					+												+			I	15	+		1			+		+			II	80
Sonchus arvensis	+																				I	5		+					+				I	20
V. Ch. Stellarietea mediae																															
Anthemis arvensis		+		+	1		+	+	1	1	+	1	+	1	+	+	+	+	+	+	V	185	+	+	+	+	+				+	1	IV	110
Fallopia convolvulus		+	+	1	1	1	+	2			1		+	+	1			1	+		IV	268	1	+		+	+	+	+		+	+	IV	120
Viola arvensis		+			+			+	+			+		1							II	50	+	+			+	+	+	+	+	+	IV	80
Myosotis arvensis					+		+	+					+	+						1	II	50	+	+		+	+		+	+	+		IV	70
Polygonum aviculare		+		+	+						+						+				II	25		+	+		+					+	II	40
Galeopsis tetrahit											+	+								1	I	35						+			+	+	II	30
Centaurea cyanus								+		r							+				I	10	+		+					+			II	30
VI. Accompanying species																															
Equisetum arvense			+	+	2	+	2	1	1	1	1		+	1	1	+			2	+	IV	443	2	+	+	1	+			+	1	1	IV	365
Erodium cicutarium			1		+	+	+	+	+	+	+		+	+	+		+		+		IV	85								+			I	10
Polygonum lapathifolium ssp. lapathifolium	+		+		1		+			+			+	+	+	1	+				III	90	+	+		1	+	+			+		III	100
Cirsium arvense								+	+	1	+	+	+	1			1		+		III	105												
Agropyron repens		+	+					1					2	+	+					+	II	138	+	2			+						II	195
Polygonum persicaria	+																				I	5	+	+	+		+				+		III	50
Convolvulus arvensis	1				+	+		+		+	2		+	1							II	163								+			I	10
Artemisia vulgaris	1				+		+		+	+	+						+		1		II	80			+		+						I	20
Achillea millefolium				+							+		+				+		+		II	25												
Veronica arvensis					+					+		1						+			I	40		+			+			+			II	30
Cerstium holosteoides																									+			+					II	20

(Sporadic species): III – *Polygonum amphibium* 24(+); *Ranunculus repens* 21(+), 24(+); *Trifolium repens* 21(+), 24(+); *Sagina procumbens* 26(+), 27(+); *Bidens tripartita* 27(2), 30(+); *Potentilla anserina* 21(+); *Rorippa sylvestris* 22(+); *Polygonum hydropiper* 26(+); *Phragmites australis* 27(3); **IV** – *Digitaria sanguinalis* 11(+), 17(+); *Geranium pusillum* 12(+), 17(+); *Galinsoga ciliata* 6(3); *Anchusa arvensis* 6(+); *Lamium purpureum* 22(+); *Rumex crispus* 28(+); *Digitaria ischaemum* 30(+); **V** – *Vicia tetrasperma* 1(+), 12(+), 19(+), 20(+), 22(+), 28(+); *Vicia angustifolia* 19(+), 20(+), 22(+), 28(+); *Conyza canadensis* 18(+), 19(+); *Vicia hirsuta* 20(+), 22(+); *Descurainia sophia* 7(+); *Sinapis arvensis* 17(+); *Arabidopsis thaliana* 20(+); **VI** – *Taraxacum officinale* 6(+), 8(+), 21(+), 22(+); *Arenaria serpyllifolia* 5(+), 12(1), 20(+); *Melandrium album* 3(+), 17(+); *Malva pusilla* 6(1), 10(+); *Erysimum cheiranthoides* 6(+), 29(+); *Erigeron acris* 17(+), 19(+); *Amaranthus retroflexus* 6(+); *Herniaria glabra* 7(+); *Hypochoeris glabra* 7(+); *Armoracia rusticana* 11(+), 30(+); *Malva sylvestris* 12(+); *Rumex acetosa* 15(+); *Urtica urens* 20(+); *Galium aparine* 21(+); *Leontodon autumnalis* 22(+); *Plantago lanceolata* 23(r); *Cardaminopsis arenosa* 26(+); *Galeopsis bifida* 29(+).

(Comments) (numbers after of species inform about numbers of picture in the table), (withered top leaves).

Echinochloo-Setarietum **Krusem. et Vlieg. (1939) 1940**

Root crops of the Podlaski Przełom Bugu mesoregion were most frequently weed infested by patches of *Echinochloo-Setarietum*. Among root crop communities, this association demonstrates the greatest internal variation which results from variable trophic and moisture conditions of its habitats. 3 subassociations were distinguished in the study area: *Echinochloo-Setarietum setarietosum glaucae*, *Echinochloo-Setarietum typicum* and *Echinochloo-Setarietum fumarietosum*, as well as 12 lower syntaxonomic units. On light soils, patches of *Echinochloo-Setarietum setarietosum glaucae* and *Echinochloo-Setarietum typicum* were noted. Within these two subassociations, 9 lower syntaxa were distinguished.

The poorest habitats were occupied by phytocenoses of *Echinochloo-Setarietum setarietosum glaucae*. The typical variant of this subassociation is documented by 20 phytosociological relevés (tab. 3). Such phytocenoses developed on soils classified as the following rye complexes: weak, good and very good. Out of the species characteristic for the association, *Echinochloa crus-galli* occurred in large numbers in these patches. *Raphanus raphanistrum* was also a permanent species of these phytocenoses, but it was noted with much lower cover. Apart from Barnyardgrass, *Setaria pumila* dominated in the patches. The other distinguishing species had much smaller cover. Among them, *Setaria viridis* and *Spergula arvensis* were noted most frequently, less frequently *Rumex acetosella* and *Scleranthus annuus*. In addition, *Chenopodium album*, *Anthemis arvensis*, *Equisetum arvense* and *Fallopia convolvulus* were also encountered often and with large cover.

The variant with *Juncus bufonius* is demonstrated by 10 phytosociological relevés (Tab. 3). Such phytocenoses were noted on different soil types. They were most frequently soils formed from clay-bedded loamy sands. In these patches, *Echinochloa crus-galli* occurred with smaller intensity than in the typical patches, *Raphanus raphanistrum* was rarely noted. But they were dominated by *Setaria pumila*. Hygrophilous species, in particular *Juncus bufonius* and *Gnaphalium uliginosum*, were also noted in them frequently and with large cover. The share of other species in the formation of these communities was similar as in the typical variant; however, a more frequent occurrence of *Stellaria media* was observed.

The association was composed of 82 species (60 in the typical variant and 61 in the variant with *Juncus bufonius*). The number of species in one relevé ranged from 10 to 23 (on the average, it was 17) in the typical variant and from 17 to 28 (on the average 22) in the variant with *Juncus bufonius*.

A part of the patches of *Echinochloo-Setarietum setarietosum glaucae*, both in the typical variant and in the wet variant, was dominated by *Digitaria ischaemum*, therefore, a subvariant with this species was distinguished in both the variants (Tab. 4). Apart from the mass occurrence of smooth crabgrass, acidophilous species distinguishing this subassociation, such as *Spergula arvensis*, *Scleranthus annuus* and *Rumex acetosella,* were noted in these patches more frequently and with larger cover. In the wet variant, apart from the hygrophilous species, *Chenopodium album* also had a large share, compared to the typical variant; *Polygonum lapathifolium* ssp. *lapathifolium* was also encountered more frequently and with larger cover.

These were much poorer phytocenoses, in terms of the species composition, compared to the above discussed. In total, 57 species were noted in them (only 34 species in the typical variant and 49 in the variant with *Juncus bufonius*). The number of species in one relevé ranged, respectively, from 10 to 18 (on the average 16) and from 11 to 29 (on the average 18).

Echinochloo-Setarietum typicum occurred commonly across the whole area of the Podlaski Przełom Bugu mesoregion. The variability of trophic and soil moisture conditions was manifested by the floristic diversity of its patches.

Typical patches developed in potato and beet crops on alluvial, pseudo-podsolic and brown leached soils classified as the following rye complexes: very good, good and weak, as well as as the good wheat complex. Phytocenoses of the typical variant are demonstrated by 15 phytosociological relevés (Tab. 5). *Echinochloa crus-galli* also occurred in large numbers in them, whereas *Raphanus raphanistrum* was found less frequently and with much smaller cover. The following nitrophilous weeds: *Chenopodium album* and *Galinsoga parviflora*, also had a large share in them. *Setaria viridis*, *Equisetum arvense*, *Anthemis arvensis*, *Fallopia convolvulus* and others were also noted frequently, but with less intensity.

The variant with *Juncus bufonius* was encountered on different soil types most frequently classified as cereal and grazing complexes. It is demonstrated by 15 phytosociological relevés (Tab. 5). These patches, similarly to the typical ones, were dominated by Barnyardgrass. The physiognomy of these phytocenoses was determined to a large extent by hygrophilous species. Among them, *Juncus bufonius* occurred in large numbers, *Gnaphalium uliginosum*, *Plantago intermedia*, *Mentha arvensis* and *Ranunculus repens* also had a large share. Nitrophilous weeds, such as *Chenopodium album*, *Polygonum lapathifolium* ssp. *lapathifolium*, *Stellaria media*, *Polygonum persicaria*, were a numerous group of species in the phytocenoses of the variant with *Juncus bufonius*.

Echinochloo-Setarietum typicum was made up of 93 species (59 in the typical variant and 80 in the variant with *Juncus bufonius*). The number of species in one

Table 4
Echinochloo-Setarietum Krus et Vlieg. (1939) 1940.

Subassociation	***setarietosum glaucae***																						
Variant	**typowy**												**z *Juncus bufonius***										
Subvariant	**z *Digitaria ischaemum***																						
No of picture in table	1	2	3	4	5	6	7	8	9	10	Mean number of species within the picture		11	12	13	14	15	16	17	18	19	20	Mean number of species within the picture	
No of picture in nature	2092	318	448	281	1957	2261	2005	2051	1917	1919			2014	1989	1985	1937	2090	2108	1056	1115	1092	942		
Data: miesiąc month	9	8	8	8	8	9	8	8	8	8			8	8	8	8	9	9	8	8	8	8		
Date rok year	97	95	95	95	97	97	97	97	97	97			97	97	97	97	97	97	96	96	96	96		
Locality	44	6	53	17	24	108	99	15	72	72			98	13	88	93	44	42	3	89	30	100		
Soil unite	6Bw pgl:pl	5Bw pgl+:gs	5F płz:pl	6F ps	6Bw ps:gl	6Bw ps:gl	4A pgm:gl	6F psp	6Bw ps:pl	6Bw ps:pl			9Dz pgl:pl	9F pgl+:ps:pl	8D gl	9F psp:pl	9A pgl:pl	9Dz pgl:pl	6F psp	5A pgl:gs	5 Fpgl+:pl	9Dz pgl:pl		
Range of cultivated plant over field in %	zn	zn	zn	60	zn	zn	zn	zn	zn	zn			zn	zn	75	zn	zn	zn	zn	zn	zn	zn		
Range of weeds over field in %	65	40	50	40	60	50	40	30	25	60			55	55	55	35	80	60	35	65	50	50		
Numbers of weeds over field in %	14	16	18	14	12	10	15	10	18	11	16		17	16	11	16	29	20	18	23	24	18	19	
Cultivated plant																								
Solanum tuberosum	z.n	z.n	z.n	4.4	z.n	z.n	z.n	z.n	z.n	z.n			z.n	z.n		z.n	z.n	z.n	z.n	z.n	z.n	z.n		
Beta vulgaris (pastewne)															5.5									
I. Ch.*Echinochloo Setarietum*											**S**	**W**											**S**	**W**
Echinochloa crus-galli	1	1	1	1	1	3	1	1	1	2	V	950	2	+	+	+	1	+	1	1	1	1	V	465
Raphanus raphanistrum	1	+	1	1			+	+	+		IV	190	+	+			+	+	1	+	+	1	IV	160
II. D. *E-S setarietosum glaucae*																								
Setaria pumila	2	2	1	1	1	1	2	+	1	+	V	795	1	+	+	+	2	2	1	+	+	1	V	550
Setaria viridis	+		1		+	+	+		1	1	IV	190	1			+	1	1		+		+	III	180
Spergula arvensis	+	+	1	+	1	+		1	+	+	V	210	+	+	1	+	+	+	1	+	1	+	V	220
Rumex acetosella	1	+	+		1		+	+			III	140		1	+		+	+	+	+	+	+	IV	120
Scleranthus annuus	+	+	+	1		+	1	+	+		IV	160					+		1	+	1	+	III	130
III. D.*var. z Juncus bufonius*																								
Juncus bufonius													1	+	2		1	+	+	+	+		IV	325
Spergularia rubra						+					I	10	+		2		+	+	+	+	+		IV	235
Gnaphalium uliginosum													1	+	+		1		+	+	+		IV	150
Gypsophila muralis													1	+			+		+	+			III	50
Polygonum amphibium																1	2					2	II	400
Mentha arvensis													1	+		1					+		II	120
IV. D.subvar. z *Digitaria ischaemum*																								
Digitaria ischaemum	2	1	1	1	3	1	1	2	1	3	V	1400	2	3	1	2	1	1	1	+	1	+	V	995
V. Ch.D. *Panico-Setarion,*																								
Polygono-Chenopodietalia																								
Galinsoga parviflora			+								I	10					+	+			+		II	30
Chenopodium album	+	+	1	1	+		+				III	140	+			+	+	+	+	3	2	+	IV	610
Stellaria media														+			1		+				II	70
VI. Ch. *Stellarietea mediae*																								
Fallopia convolvulus	+	+	1	1			+	+	+	+	IV	160	+			+	+	+	+	+	+		IV	70
Anthemis arvensis	1	+				+	1	1	+	+	II	30	+	+				+				1	II	80
Viola arvensis			+				+				I	20	+		+	+				+			II	40
Myosotis arvensis													+				+				+		II	30
Polygonum aviculare		+		+			+				II	30		+									I	10
VII. Accompanying species																								
Equisetum arvense	1	+	1	1	1	1	+	+	+	1	V	340		+			1	1	1	2	1	1	IV	435
Polygonum lapathifolium ssp. lapathifolium	+			+	+						II	30			+	+	1	+	+	+		+	IV	110
Agropyron repens		+			+		+			+	II	40				1		2					I	225
Erodium cicutarium			+				+		+	+	II	40				+				+		+	II	30
Polygonum persicaria		+	+								I	20		+					+		+	+	II	40
Artemisia vulgaris				+					+		I	20			+	+				+			II	30
Convolvulus arvensis					+					+	I	20				+				+			I	20
Cirsium arvense			+		+						I	20	+						+	+	+		II	40

(Sporadic species): III *Polygonum hydropiper* 12(+), 20(1); *Stachys palustris* 14(+), 15(1); *Bidens tripartita* 16(1), 20(+); *Sagina procumbens* 15(+); *Ranunculus repens* 15(+); *Anthoceros punctatus* 15(+); **V** *Polygonum lapathifolium* ssp. *pallidum* 2(1), 3(+), 4(+); *Capsella bursa-pastoris* 15(+), 19(+); *Matricaria maritima* ssp. *inodora* 15(+); *Oxalis stricta* 16(+); Galinsoga ciliata 18(+); **VI** - Galeopsis tetrahit 16(+), 20(+); Vicia angustifolia 9(+), 19(+); Centaurea cyanus 9(+); Vicia hirsuta 9(+); Vicia tetrasperma 16(+); **VII** Plantago major 1(+), 15(+), 19(+); *Poa annna* 6(+), 19(+); *Echium vulgare* 4(+), 9(+); *Cerastium holosteoides* 15(+), 18(+); *Hypochoeris glabra* 2(+); *Ornithopus sativus* 3(+); *Galeopsis ladanum* 9(+); *Achillea millefolium* 9(+); *Trifolium repens* 15(+); *Veronica arvensis* 19(+); *Galeopsis bifida* 19(+).

(Comments): (numbers after of species inform about numbers of picture in the table), (withered top leaves).

Table 5
Echinochloo-Setarietum Krus. et. Vlieg. (1939) 1940.

Subassociation	typicum																																
Variant	typowy																z Juncus bufonius																
No of picture in table	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Mean numer of species within the picture	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Mean numer of species within the picture	
No of picture in nature	1836	1826	1861	935	887	480	347	293	2215	2050	2061	2008	2040	1942	1962		1828	2244	2042	2044	1165	1167	1124	1121	1152	1107	433	405	417	2189	2117		
Data: miesiąc month	9	8	8	8	8	9	8	8	9	8	8	8	8	8	8		8	9	8	8	8	8	8	8	8	8	8	8	8	9	9		
Date rok year	97	97	97	96	96	95	95	95	94	97	97	97	97	97	97		97	97	97	97	96	96	96	96	96	96	95	95	95	94	97		
Locality	87	66	56	100	96	12	32	60	22	15	14	99	98	38	73		66	92	98	98	36	36	89	89	63	28	54	11	37	76	48		
Soil unite	6Bw pgl.ps:pl	5M ps:pl	5Bw pgl.p.ps:p.pl	6Bw ps:pl	4A pgl.gl	5F plz:pl	5F psp.plz	5Bw pgl:gl	4Bw pgm.gs	6F psp	4F pgmp:pl	5A ps:gl	6F pgl.p.ps:pl	6Bw ps:pl	4A pgl.gl		5M ps:pl	9F pgl.p.ps:pl	9F pgl.p.ps:pl	9F pgl.p.psp:pl	8A pgm.gs	8Dz pgm.gs	9Bw ps.pl:gs	9Bw ps.pl:gs	8Dz gl.gsp:gc	8A pgl:gl	9Dz ps:pl	5Bw pgmp.pl	4Bw pgm.glp.pl	9D ps:plz	9F pgl.plz		
Range of cultivated plant over field in %	z.n	80	z.n	z.n	z.n	z.n	z.n	z.n	85	z.n	z.n	z.n	z.n	z.n	z.n		80	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n		
Range of weeds over field in %	40	40	75	60	60	80	60	85	35	35	60	50	45	45	55		30	80	55	85	80	85	70	80	90	70	85	60	80	65	70		
Numbers of weeds over field in %	15	17	15	14	15	17	25	25	12	13	17	17	17	12	11	15		19	20	18	31	26	28	40	30	36	40	32	24	33	26	32	26	
Cultivated plant																																	
Solanum tuberosum	z.n	5.5	z.n	z.n	z.n	z.n	z.n	z.n		z.n		z.n	z.n	z.n	z.n		5.5	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n		
Beta vulgaris (pastewne)																																	
Beta vulgaris (cukrowe)									5.5		4.4																						
I. *Ch.Echinochloo-Setarietum*																S	W														S	W
Echinochloa crus-galli	2	2	3	2	3	2	1	1	2	2	2	3	1	1	3	V	1950	1	2	2	2	1	1	+	1	3	2	2	1	2	3	2	IV	1490
Raphanus raphanistrum	+	+		1	+	1	1	1			+			1		III	193	1	+		+	+	1	+	+	1	1		2	1	+		IV	323
II. *D.var. z Gnaphalium uliginosum*																																	
Juncus bufonius																		1	3	2	1	2	1	+	3	2	2	1		1	1		V	1173
Gnaphalium uliginosum																		1	+	1	1	+	1	1	1	1	1	1	1	1	1	2	V	530
Plantago intermedia											+					I	7	+	+	+	+		1		1	+	+	1	1	1	+	+	V	220
Mentha arvensis																			1		3			2	1		+	1	1	+			III	513
Ranunculus repens																					+	3	2		1	1	1			+			III	480
Gypsophila muralis																						1	+			1	+		1	+	1		III	153
Rorippa sylvestris																						1			1			2				1	II	217
Potentilla anserina																			+			+		2				1					II	163
Stachys palustris																				1	+			+					1			+	II	87
Spergularia rubra																		+				+			+				1		+		II	60
Sagina procumbens																						+	+			+		1				+	II	60
Riccia sp																				+	+			+		+				+			II	33
Myosurus minimus																						+	+	+	+	+							II	33
Anthoceros punctatus																				+	+			+		+							II	27

cd. Table 5

III. *Ch. D. Panico-Setarion,*																																
Polygono-Chenopodietalia																																
Chenopodium album	1	+	1	2	2	1	1	3	1	1	2	+	1	1	+	V	887	+	+	+		1	2	1		+	1	+	+	+	1	1	V	330
Setaria viridis	1	+	+	+		+	+	1		1		1	2	1	+	IV	323	+		1	+			+			1		+		+	+	III	107
Galinsoga parviflora	+	1	1		+	3	2	2	1	1	+	1			1	IV	703		+	1				1			+				+	+	II	93
Stellaria media		1	+		1		+	+			+	+			+	III	107		+	+	2	1	2	+	1		+	1		+	+	1	IV	407
Spergula arvensis						+	+	+								I	20	+				+		+	+	1	+	+	+	+	+		IV	93
Matricaria maritima ssp. inodora					+	+					2	1				II	163				+	+	1	+	+	1	+				1	+	III	140
Capsella bursa-pastoris	+	1					+	+				+				II	60						+	+	+		+	+				+	II	40
Sonchus arvensis								1				+				I	40		1					1	+	+	+					+	II	93
Polygonum lapathifolium ssp. pallidum				+	+		+	+								II	30	+										+	+	+			II	27
IV. *Ch. Stellarietea mediae*																																		
Fallopia convolvulus	+	+	+		+		1		+	+		+		1	+	IV	120	+		+	+	+	+	+	+	+	+	1		+	+	+	V	113
Anthemis arvensis		+		+	+		+	1		+	+	+	1	+	+	IV	127	+		+	+		+	+	+	+	+		1	+	+		IV	100
Myosotis arvensis										+			+			I	13		+	+	+		+	+	+	1	+	+				+	IV	93
Vicia hirsuta	+				+			+	+				+			II	33						+	+	+	+	+	+				+	III	47
Galeopsis tetrahit		+					+	+								I	20				+	+			+	+	+	+	+	+			+	III	60
Centaurea cyanus	+													+		I	13						+	+	+	+	+		+		+	+	III	60
Vicia tetrasperma		+														I	7	+				+	+	+	+	+	+						III	47
Viola arvensis							+			+		+	+	+		II	33				+			+			+	+		+	+		II	40
Polygonum aviculare							+	+		+						I	20					+		+	+	+					+	+	II	40
Vicia angustifolia				+												I	7					+	+		+	+							II	30
V. *Accompanying species*																																		
Polygonum lapathifolium ssp. lapathifolium			2	+	+				+	+	+	+	+			III	163	1	+	+	+	1	+	1	1	+	+	1	1	2		+	V	363
Equisetum arvense	1	+		+	+	+	1			+		+		1	+	IV	147		+		+	+	1	+	+		+			1		2	III	223
Polygonum persicaria				+			+		+		+					II	27	+	+		1		+	+	1	+	+	+	+	1	+		IV	160
Agropyron repens				2		+	1				+			2		II	280					+	+	1			+	+		1	+		III	100
Erodium cicutarium		+	+	+		+	+	1					+		+	III	80							+		+		+			+	+	II	33
Veronica arvensis				+	+						+	+				II	27		+				+	+	+	+	+	+			+	+	III	60
Artemisia vulgaris	+	+			1	+		+		+			+	+		III	80			+	+									+		+	II	27
Cirsium arvense	+					1	1	+	+		+					II	93		+					+			+	1		+			II	60
Convolvulus arvensis						+	+	+		+		+			1	II	67							+					+	+			I	20
Melandrium album		+					+	+	+			+	+			II	40																	
Taraxacum officinale					+						+					I	13	+									+	+	+	+		+	II	40
Erysimum cheiranthoides							+									I	7							+			+	1	+				II	53
Trifolium repens																						+	+			1	+				+	+	II	67
Plantago major																					+		+				+	+		+		+	II	40

(Sporadic species): II – *Polygonum hydropiper* 23(+), 28(+), 30(1); *Bidens tripartita* 17(2), 24(+); *Phragmites australis* 19(+); *Polygonum amphibium* 13(+), 19(+); *Veronica serpyllifolia* 19(+); **III** – *Setaria pumila* 1(+), 3(+), 8(+), 30(+); *Rumex acetosella* 6(+), 21(+), 26(+), 28(+); *Geranium pusillum* 3(+), 13(+), 24(+); *Scleranthus annuus* 27(+), 28(+), 29(+); *Sonchus asper* 17(+), 30(+); *Lamium purpureum* 11(+); *Digitaria ischaemum* 16(+); *Euphorbia helioscopia* 25(+); *Sonchus oleraceus* 30(+); **IV** – *Crepis tectorum* 17(+), 23(+), 25(+), 29(+); *Anchusa arvensis* 1(+), 3(+), 22(+); *Thlaspi arvense* 11(+), 25(+), 27(+); *Anagallis arvensis* 12(+), 19(+), 22(+); *Sinapis arvensis* 4(+), 6(+); *Digitaria sanguinalis* 7(+), 8(+); *Vicia villosa* 8(+), 27(+); *Arabidopsis thaliana* 19(+), 26(+); *Rumex crispus* 20(+), 28(+); *Papaver rhoeas* 8(+); **V** – *Galium aparine* 1(+), 3(+), 9(+), 25(+); *Galeopsis bifida* 2(+), 16(+), 24(+), 25(+); *Amaranthus retroflexus* 3(1), 6(1), 11(1), 13(1); *Poa annua* 2(+), 14(+), 26(+); *Chamomilla suaveolens* 20(+), 24(+), 30(+); *Armoracia rusticana* 6(+), 7(+); *Malva pusilla* 7(+), 30(+); *Cardaminopsis arenosa* 13(+), 26(1); *Achillea millefolium* 26(+), 28(+); *Malva neglecta* 3(+); *Trifolium arvense* 8(+); *Cichorium intybus* 8(r); *Urtica urens* 9(+); *Arenaria serpyllifolia* 13(+); *Oenothera biennis* 13(+); *Erigeron acris* 16(+); *Lathyrus pratensis* 19(+); *Achillea ptarmica* 19(+); *Stellaria graminea* 24(+); *Agrostis stolonifera* 28(+).

(Comments) (numbers after of species inform about numbers of picture in the table), (withered top leaves).

Table 6
Echinochloo-Setarietum Krus. et Vlieg. (1939) 1940.

Subassociation	**typicum**																													
Variant	**typowy**												***z Gnaphalium uliginosum***																	
Subvariant	***z Oxalis stricta***																													
No of picture in table	1	2	3	4	5	6	7	8	9	10	Mean number of species within the picture		11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Mean number of species within the picture	
No of picture in nature	2140	2110	964	358	357	334	485	306	302	468			2157	2156	2148	2144	2143	2130	1856	2070	2078	348	350	363	432	451	1009		
Data: month	9	9	8	8	8	8	9	8	8	9			9	9	9	9	9	9	8	9	9	8	8	8	8	8	8		
Date year	97	97	96	95	95	95	95	95	95	95			94	94	94	97	97	97	97	97	97	95	95	95	95	95	96		
Locality	16	42	41	32	32	82	12	58	58	62			5	5	5	16	16	107	56	43	81	32	32	106	54	53	26		
Soil unite	4A pgm.gl	5Bw pgl.ps	4F plz.gsp.pl	4A plz	2D plz	4F plz.pl	5F plz.pl	5F psp.plz	5F plz.pgl	4F plz.pl			8F plz.pgl	9F pgl.ps.pl	8F glp.pgl	8F pglp.pgl	9Dz pgl.ps	4D pgm.pgl	5Bw pglp.psp.pl	8F plz	9Dz pgl.pl	4A plz	2D plz	2A plz	9Bw ps.pl	9Bw ps.gl	2Dd pgmp.gl		
Range of cultivated plant over field in%	zn	zn	zn	zn	zn	zn	zn	zn	zn	90			zn	zn	zn	zn	zn	80	zn	zn	zn	zn	zn	zn	zn	zn	zn		
Range of weeds over field in %	60	50	70	70	80	50	80	90	85	15			85	50	65	50	60	20	70	90	60	100	90	70	90	40	100		
Numbers of weeds over field in %	10	12	20	20	29	21	30	26	30	34	23		29	26	20	30	26	25	27	35	23	32	29	35	27	42	31	29	
Cultivated plant																													
Solanum tuberosum	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n				z.n	z.n	z.n	z.n	z.n		z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n	z.n		
Beta vulgaris										5.5																			
Beta vulgaris																		5.5											
I. Ch.*Echinochloo-Setarietum*											S	W																S	W
Echinochloa crus-galli	2	1	+	3	1	1	+	1	1	1	V	870	3	2	3	+	+	1	1	+	+	2	1	1	+	+	3	V	1157
Raphanus raphanistrum				+	+		2	1	1		III	295	+		+							+	1	+	1	+		III	357
II. D.var. z *Gnaphalium uliginosum*																													
Gnaphalium uliginosum				+							I	10	2	2	2	1	1		1		+	+	1	+	1	1		V	570
Plantago intermedia						+					I	10	+	+	1			+	+	+		+	+	+		1		IV	120
Stachys palustris				+			+				I	20	2	1					1	1		+		2	1	1		III	407
Mentha arvensis																+	1			3		1		1			2	II	473
Potentilla anserina																						1	2	+			1	II	190

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Juncus bufonius													1	1		+									+			II	80
Sagina procumbens													+	1		+					+					+		II	60
Gypsophila muralis													+	+	+							+		+		+		II	40
Riccia sp.													+	+		+	+											II	27
Anthoceros punctatus													+	+			+				+							II	27
III. D.subvar. z *Oxalis stricta*																													
Oxalis stricta	1	+	1	2	1	1	1	1	1	1	V	585	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	V	583
IV. Ch. D. *Panico-Setarion*																													
Setaria viridis	+						+	1	1	+	III	130				+				+		+				+	+	II	33
Rumex acetosella		+		+	+		+	+		+	III	60					+					+	+		+	+		II	33
Spergula arvensis				+				+			I	20										+	+	+	+	+		II	33
Setaria pumila														+	+					1				+	+		+	II	67
V. Ch. D. *PolygonoChenopodion, Polygono-Chenopodietalia*																													
Chenopodium album	+	3		1	3	1	1	2	2	1	V	1310	+	+	+	+	+	+	1	1		2		1	1	1	+	V	330
Stellaria media		1	1	1	1	1	1		1	1	IV	400	+	+	+	1	1	+	1	+	1	+	1	2		+	+	V	337
Galinsoga parviflora	2	1	1	1	+		2		2	+	IV	695		+	+	2	+	1	1	1	1	3		+			+	IV	533
Sonchus arvensis			+			+	1	+	+		III	90		+		+	+		+	1	+	1		+			3	III	357
Polygonum lapathifolium ssp. pallidum					+	+	+	+	+	+	III	60		+								+	+	+	1	+		II	67
Capsella bursa-pastoris					+		+	+	+	+	III	50			+		+	+	+	+		+	+	+			+	III	60
Sonchus asper		+									I	10				+		+		+	+							II	27
Galinsoga ciliata															+			+				1		+			+	II	60
Veronica persica															+			+	+		+							II	27
VI. *Ch. Stellarietea mediae*																													
Fallopia convolvulus		+		+	+	1		2		+	III	265		+	+	+	+		+	+	+		+	+		1	+	IV	100
Galeopsis tetrahit			+	+					1		II	70		+	+	+	+		+		1		+	+	+	+	+	IV	100
Myosotis arvensis					+			+	+		II	40	1	+		+	+		+	+	+					+	+	III	87
Viola arvensis	+				+	+		1		+	III	90				+									+	+		I	20
Anthemis arvensis				+	+				+		II	30	+									+		+	1	+	+	II	67

cd. Table 6

Polygonum aviculare						+	+	+		+	II	40			+			+						+		+	+	II	33
Vicia tetrasperma		+							+	+	II	30	+			+				+								I	20
Rumex crispus							+		+	+	II	30						+					+				+	I	20
Centaurea cyanus					+	+			+		II	30														+		I	7
Anagallis arvensis			1							+	I	60					+	1	+								+	II	53
VII. Accompanying species																													
Polygonum lapathifolium ssp. lapathifolium	+		2	+	+	1	1	+	1	+	V	375	+	+		+			+			+	1	+	3	+		III	330
Cirsium arvense					2	2	1	1	1		III	500	+		+	+			1	+	+	+	2	+	+	+		IV	210
Polygonum persicaria				+	+	+		+		+	III	50	+			+	+	+		+		+	1	+	+		+	IV	93
Agropyron repens		+	2	+				2	1		III	420				1			1	1			1	+	2	1		III	290
Convolvulus arvensis	2			+	+		1		+	+	III	265	+						1		+	+	+	1		+	+	III	107
Equisetum arvense				+		1		1	1		II	160					3			+	+	1	1	1	1	1	+	III	437
Veronica arvensis					+	+	1				II	70	+			+	+	+	+	+				+		+		III	53
Plantago major						+	+	+			II	30		+		+	+			+		+		+		+	+	III	53
Erysimum cheiranthoides					+	+	1	+			II	80				2	+	+	+			+	+	+				III	157
Artemisia vulgaris	+						+		+	+	II	40	+	+	+				1	+	+	+	+			+		III	87
Melandrium album			+		+		+	+		+	III	50	+	+			+											I	20
Armoracia rusticana					1		+	1			II	110							1			+	1			+		II	80
Erodium cicutarium		+						+	1		II	70							+				+	+	+	+		II	33
Galium aparine			+								I	10	+				1			1	1							II	107
Taraxacum officinale					+		+			+	II	30						+		+				+				I	20
Achillea millefolium						+	+	+		+	II	40										+	+					I	13

Sporadic species: II – *Polygonum amphibium* 8(+), 18(1), 19(3), 21(+); *Ranunculus repens* 3(+), 16(+); *Bidens tripartita* 11(+), 18(+); *Rorippa sylvestris* 16(+), 20(2); *Polygonum hydropiper* 22(1), 23(+); S*pergularia* rubra 13(1); *Centunculus minimus* 14(+); *Ranunculus sardous* 16(+); **IV** – Scleranthus annuus 6(+), 12(+); **V** – *Matricaria maritima* ssp. *inodora* 2(+), 11(+), 12(+), 25(+); *Lamium purpureum* 5(1), 15(+), 16(+), 25(+); *Euphorbia helioscopia* 16(+), 18(1), 25(1); *Fumaria officinalis* 3(1), 25(+); *Geranium pusillum* 5(+), 17(+); *Sonchus oleraceus* 18(+), 19(+); *Atriplex patula* 3(1); *Veronica agrestis* 17(+); *Veronica polita* 17(+); **VI** – *Sinapis arvensis* 3(1), 18(1), 19(+), 25(1); *Arabidopsis thaliana* 10(+), 14(+), 19(+), 24(+); *Vicia hirsuta* 9(+), 11(+), 24(+); *Anchusa arvensis* 4(+), 6(+); *Vicia angustifolia* 9(+), 24(+); *Melandrium noctiflorum* 10(+), 18(+); *Vicia villosa* 18(+), 24(+); *Crepis tectorum* 23(+), 24(+); *Chaenorhinum minus* 14(+); *Sisymbrium officinale* 16(+); *Papaver rhoeas* 18(+); *Thlaspi arvense* 25(+); **VII** – *Symphytum* officinale 4(+), 7(+), 20(+), 21(+); *Arenaria serpyllifolia* 5(+), 10(+), 16(+), 21(+); Erigeron acer 5(+), 7(+), 14(+), 24(+); *Galium spurium* 9(+), 11(+), 14(+), 15(+); *Cardaminopsis arenosa* 10(+), 11(+), 12(+), 24(+); *Malva pusilla* 5(+), 9(+), 22(+); *Amaranthus retroflexus*1(1), 5(1), 18(+); Linaria vulgaris 3(+), 10(+); *Saponaria officinalis* 7(r), 9(r); *Plantago lanceolata* 7(r), 10(r); *Malva neglecta* 9(+), 19(+); *Poa annua* 10(+), 16(+); *Silene vulgaris* 3(+); *Glechoma hederacea* 3(+); *Achillea ptarmica* 3(+); *Galeopsis bifida* 3(+); *Rumex confertus* 7(r); *Malva sylvestris* 9(+); *Oenothera biennis* 10(+); *Tanacetum vulgare* 10(+); *Cerastium holosteoides* 10(+); *Stellaria graminea* 10(+); *Trifolium dubium* 10(r); *Artemisia absinthium* 13(r); *Leucanthemum vulgare*15(r); *Sinapis alba* 18(+); *Herniaria glabra* 21(+); *Leontodon autumnalis* 23(+); *Lycopus europeus* 23(r); *Trifolium hybridum* 23(+); *Lysimachia vulgaris* 23(r); *Lythrum salicaria* 23(r); *Hypochoeris radicata* 24(+); *Trifolium campestre* 24(+); *Trifolium arvense* 24(+); *Trifolium repens 24(+); Medicago lupulina 25(+); Neslia paniculata 25(+).*

(Comments) (numbers after of species inform about numbers of picture in the table), (withered top leaves).

relevé ranged, respectively, 11 – 25 (on the average 15) and 18 – 40 (on the average 26).

A part of patches of *Echinochloo-Setarietum typicum* was marked by the numerous occurrence of *Oxalis stricta*, and they were classified as a subvariant with this species. Such phytocenoses developed on different soil types, quite frequently these were soils formed from ordinary dusty soils. They were encountered more frequently in excessively wetted habitats. This subvariant is demonstrated by 25 phytosociological relevés, 10 for the typical variant and 15 for the wet variant with *Gnaphalium uliginosum* (Tab. 6).

The patches of the subvariant with *Oxalis stricta*, similarly to the typical variant, were dominated by *Echinochloa crus-galli*. Nitrophilous species: *Chenopodium album* (especially in the typical variant), *Stellaria media*, *Galinsoga parviflora*, *Polygonum lapathifolium* ssp. *lapathifolium*, also had a very large share in them. In the wet variant, *Gnaphalium uliginosum*, *Plantago intermedia*, *Stachys palustris*, and locally *Mentha arvensis* and *Potentilla anserine*, occurred most frequently and with the largest cover.

These phytocenoses were floristically rich; they were composed of 120 species (78 in the typical variant and 103 in the wet variant). The number of species in one relevé ranged, respectively, from 10 to 34 (on the average 23) and from 20 to 42 (on the average 29).

DISCUSSION

In root crops on light soils of the Podlaski Przełom Bugu mesoregion, two associations were distinguished: *Digitarietum ischaemi*, *Echinochloo-Setarietum* and the *Setaria pumila-Setaria viridis* community. The internal variation of the distinguished communities proves the diversity of habitat conditions.

Most frequently, the studied plantations were covered by patches of *Echinochloo-Setarietum*. The great floristic variation of the phytocenoses of this association and their frequent occurrence result from a wide ecological amplitude of the characteristic species of this association. *Echinochloo-Setarietum* is the most wide-spread association among root crops in Poland. It was reported, *inter alia*, from Jura Krakowska (Kraków Jurassic area) (Kornaś, 1950), from the Lubelszczyzna region Fijałkowski (1967), from Równina Piotrkowska (Piotrków Plain) (Warcholińska, 1974), from Pasmo Przedborsko-Małogoskie (Przedborsko-Małogoskie Range) (Wnuk, 1976), from Wał Trzebnicki (Trzebnica Morraine Belt) (Anioł-Kwiatkowska, 1990), from Wysoczyzna Siedlecka (Siedlce Plateau) (Skrzyczyńska, 1994). The diversity of habitats affects changes in the floristic composition of the patches of this association. Such variability is described by: Warcholińska (1974), Wnuk (1976), Anioł-Kwiatkowska (1990), Skrzyczyńska (1994) and others.

The poorest habitats in the study area were occupied by the phytocenoses of *Digitarietum ischaemi*. They occurred on poor and acid sandy soils in various moisture conditions. The composition and structure of typical phytocenoses of *Digitarietum ischaemi* in root crops of the Podlaski Przełom Bugu mesoregion do not differ from those reported from other areas of the country (Warcholińska, 1974; Siciński; 1974, Wnuk, 1976, Anioł-Kwiatkowska, 1990, Skrzyczyńska, 1994, Węgrzynek, 2005 et al.). Due to specific habitat conditions (water and nutrient deficiency, excess heat and strong acidification) on which patches of *Digitarietum ischaemi* are encountered, the wet variant of this association was rarely distinguished (Anioł-Kwiatkowska, 1990, Siciński, 2003).

In root crops, contrary to cereal crops, impoverished phytocenoses are found less frequently. It results, *inter alia*, from different ways of spreading of weeds in these crop groups, as well as from the intensity of chemical treatment. In cereal crops, speirchoric species are easily eliminated by cleaning of seed material, whereas in root crops, organic fertilisation and insufficient herbicide control on the studied plantations result in a strong development of weed infestation, especially secondary weed infestation.

The *Setaria pumila-Setaria viridis* community corresponds in its floristic composition to species-poor phytocenoses from the *Panico-Setarion* alliance described by Węgrzynek (2005). However, within the area of the Podlaski Przełom Bugu mesoregion, *Setaria pumila* and *Setaria viridis* had a markedly larger share in the patches of this community. Similar communities from other regions of Poland were reported by: Wnuk (1989), Wnuk et al. (1989).

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Zbiorowiska roślinne pól uprawnych Podlaskiego Przełomu Bugu

Cz. V. Zbiorowiska upraw okopowych gleb lekkich

Streszczenie

Przedstawione w niniejszej pracy zbiorowiska roślin okopowych uprawianych na glebach lekkich są częścią charakterystyki zbiorowisk segetalnych Podlaskiego Przełomu Bugu. Na podstawie 160 zdjęć fitosocjologicznych wykonanych metodą Braun-Blanqueta wyróżniono fitocenozy reprezentujące związek *Panico-Setarion*. Najczęściej na badanym terenie notowano płaty *Echinochloo-Setarietum*. Zróżnicowanie florystyczne fitocenoz tego zespołu warunkują różnorodne warunki siedliskowe. Na siedliskach zaliczanych do gleb lekkich wyróżniono dwie subassocjacje tego zespołu, które skład florystyczny różnicuje na 9 niższych rangą syntaksonów. Wyróżnione zostały podzespoły *Echinochloo-Setarietum setarietosum glaucae* z wariantami typowym i z *Juncus bufonius* oraz podwariantami z *Digitaria ischaemum*, a także *Echinochloo-Setarietum typicum* wariant typowy oraz wariant z *Juncus bufonius* i podwariant z *Oxalis stricta* w wariancie typowym i wilgotnym. Zespół ten jest najbardziej rozpowszechniony i zróżnicowany florystycznie. Drugim zespołem gleb lekkich wykształcającym się w uprawach okopowych Podlaskiego Przełomu Bugu jest *Digitarietum ischaemi*. Jego płaty zachwaszczają przede wszystkim uprawy na glebach lekkich, kwaśnych i mało żyznych. Cechą tych zbiorowisk jest liczne występowanie wielu gatunków acidofilnych. W warunkach siedlisk Podlaskiego Przełomu Bugu *Digitarietum ischaemi* różnicuje się na wariant typowy i wilgotny. Dość częstymi fitocenozami, zajmującymi siedliska pośrednie między *Digitarietum ischaemi* a *Echinochloo-Setarietum* są płaty zbiorowiska *Setaria pumila-Setaria viridis*.

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